

1

METHOD AND APPARATUS FOR FACILITATING ACCESS THROUGH A PATIENT TISSUE

RELATED APPLICATION

This application claims priority from U.S. Provisional Application No. 61/654,175, filed 1 Jun. 2012, the subject matter of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

The present invention relates to an apparatus and method for facilitating access through a patient tissue and, more particularly, to a method and apparatus for facilitating access through a patient skin surface.

BACKGROUND OF THE INVENTION

Many surgical procedures are performed through an incision in a patient's skin surface. The skin surface is cut, generally through the use of a hand-held scalpel blade, to produce a surgical wound/incision at a desired access site. The surgical incision is usually substantially linear, but because the cut is made free-hand, the incision may not be precisely located or shaped (e.g., there may be curved or curvilinear aspects to the incision), and may have differing cut depths along its length according to the varying pressure applied to the scalpel blade. The surgeon may also inadvertently make small angulations during this freehand incising, which "bevels" the incision edges and thereby contribute to healing delays and/or poor scar formation.

The surgical procedure is carried out in any desired manner, using the surgical incision for access. Once the invasive portion of the surgical procedure is complete, the surgeon begins approximating the surgical incision by pulling the incision edges together into alignment and placing sutures, clips, staples, adhesives, or other fasteners to hold the edges closed for healing. However, this portion of the access procedure is also generally accomplished manually and free-hand, so the approximation and fastener placement are often uneven and/or imprecisely done, despite the best efforts of the surgeon. Also, despite an emphasis on incision edge eversion during surgeon training, advantageous contact between the deep dermis on both edges of the incision does not always occur during freehand incision approximation, thus potentially hindering healing of the surgical incision.

SUMMARY OF THE INVENTION

In an embodiment of the present invention, a system for facilitating access through a patient skin surface. The skin surface is substantially planar and laterally oriented. A guiding substrate extends substantially parallel to the skin surface and is selectively directly fastened thereto. The guiding substrate, when fastened to the skin surface, supports a guiding structure in a substantially fixed relationship to an access site of the skin surface. A tool carriage is configured to accept at least a chosen one of a plurality of surgical tools for sequential interaction with the access site. The tool carriage includes a following structure configured for selective engagement with the guiding structure such that the tool carriage is guided along a predetermined action path when the following structure and guiding structure are engaged and motive force is provided to the tool carriage. When the surgical tool is an incising tool, the tool carriage is guided along the action path

2

with the incising tool in penetrating contact with the access site of the skin surface to create a laterally elongate incision at the access site, using the incising tool, and thereby provide access below the skin surface. When the surgical tool is a closure tool, the tool carriage is guided along the action path to substantially close the incision at the access site, using the closure tool, and thereby prevent access through the incision below the skin surface.

In an embodiment of the present invention, a method of facilitating access through a patient skin surface is provided. The skin surface is substantially planar and laterally oriented. A guiding substrate is directly fastened to the skin surface. The guiding substrate extends substantially parallel to the skin surface. A guiding structure is supported in a substantially fixed relationship to an access site of the skin surface with the guiding substrate. A tool carriage is configured to accept at least a chosen one of a plurality of surgical tools for sequential interaction with the access site. The tool carriage includes a following structure. The following structure is selectively engaged with the guiding structure. The tool carriage is guided along a predetermined action path when the following structure and guiding structure are engaged and motive force is provided to the tool carriage. When the surgical tool is an incising tool, the tool carriage is guided along the action path with the incising tool in penetrating contact with the access site of the skin surface to create a laterally elongate incision at the access site, using the incising tool, and thereby provide access below the skin surface. When the surgical tool is a closure tool, the tool carriage is guided along the action path to substantially close the incision at the access site, using the closure tool, and thereby prevent access through the incision below the skin surface.

In an embodiment of the present invention, a device for facilitating access through a patient skin surface is provided. The skin surface is substantially planar and laterally oriented. A pair of guiding rails are fastened to the skin surface. The guiding rails are laterally spaced along the skin surface with an access site on the skin surface interposed laterally between the guiding rails. At least one tool carriage is configured to movably engage the guiding rails such that motive force exerted in the transverse direction upon the tool carriage causes the tool carriage to move, guided by the rails, in the transverse direction. An incision tool is selectively carried by a tool carriage and accordingly is guided by the movable engagement between the tool carriage and the guiding rails to create a transversely extending incision in the skin surface at the access site and thereby provide access through the skin surface. A closure tool is selectively carried by a tool carriage and accordingly guided by the movable engagement between the tool carriage and the guiding rails to close the incision in the skin surface at the access site and thereby substantially prevent access through the skin surface.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the invention, reference may be made to the accompanying drawings, in which:

FIG. 1 is a top view of a plurality of components according to an embodiment of the present invention;

FIGS. 2A-2B are top views of a component of the embodiment of FIG. 1 in two example configurations;

FIG. 3A is a perspective side view of a component of the embodiment of FIG. 1;

FIG. 3B is a bottom view of the component of FIG. 3A;

FIG. 4 is a perspective side view of the components of FIGS. 2A and 3A-3B in an example use configuration;